

CLAIMS

What is claimed is:

1 1. A method comprising:
2 applying a flux on a substrate having solder bumps, the flux including at least a
3 solvent and a water soluble monomer or a water soluble polymer;
4 placing a die on the substrate; and
5 reflowing the die in an oven at a reflow temperature to redistribute stress caused
6 by coefficient thermal expansion (CTE) mismatch between the substrate and the die,
7 the reflow temperature being higher than a melting point of the polymer.

1 2. The method of claim 1 wherein applying the flux comprises:
2 applying the flux including the water soluble polymer being one of a polyacrylic
3 acid, a polyacrylamide, a polyvinyl alcohol, a starch, and a cellulose.

1 3. The method of claim 1 wherein applying the flux comprises:
2 applying the flux including at least an organic solvent and the water soluble
3 monomer.

1 4. The method of claim 1 wherein applying the flux comprises:
2 applying the flux including at least an organic solvent and the water soluble
3 polymer.

1 5. The method of claim 1 wherein reflowing the die comprises:
2 vaporizing the solvent at an increasing reflow temperature;
3 melting the polymer into polymer liquid; and
4 removing metal oxide from the solder bumps.

1 6. The method of claim 5 wherein reflowing the die further comprises:
2 melting the solder bumps;
3 forming solder joints from the melted solder bumps;
4 solidifying the solder joints at a decreasing reflow temperature; and
5 solidifying the polymer liquid to redistribute the stress.

1 7. The method of claim 1 wherein reflowing the die comprises:

2 vaporizing the solvent at an increasing reflow temperature;
3 reacting the monomer to form solid polymer;
4 melting the solid polymer into polymer liquid; and
5 removing metal oxide from the solder bumps.

1 8. The method of claim 7 wherein reflowing the die further comprises:
2 melting the solder bumps;
3 forming solder joints from the melted solder bumps;
4 solidifying the solder joints at a decreasing reflow temperature; and
5 solidifying the polymer liquid to redistribute the stress.

1 9. The method of claim 1 further comprising:
2 de-fluxing the die to remove polymer residue; and
3 dispensing an underfill material into gap between the die and the substrate.

1 10. The method of claim 9 wherein de-fluxing comprises:
2 dissolving the polymer residue by hot water.

1 11. A method comprising:
2 mixing a solvent with at least a water soluble monomer or a water soluble
3 polymer to form a flux; and
4 applying the flux to a die assembly including a die and a substrate to
5 redistribute stress caused by coefficient thermal expansion (CTE) mismatch between
6 the substrate and the die.

1 12. The method of claim 11 wherein mixing comprises:
2 mixing the solvent with the water soluble polymer being one of a polyacrylic
3 acid, a polyacrylamide, a polyvinyl alcohol, a starch, and a cellulose.

1 13. The method of claim 11 wherein mixing comprises:
2 mixing an organic solvent and the water soluble monomer.

1 14. The method of claim 11 wherein mixing comprises:
2 mixing an organic solvent and the water soluble polymer.

1 15. The method of claim 11 wherein applying the flux comprises:

2 reflowing the die assembly in an oven at a reflow temperature, the reflow
3 temperature being higher than a melting point of the polymer.

1 16. The method of claim 15 wherein reflowing the die assembly comprises:
2 increasing the reflow temperature to melt the polymer into polymer liquid and
3 to form solder joints from the solder bumps; and
4 decreasing the reflow temperature to solidify the solder joints and the polymer
5 liquid.

1 17. The method of claim 15 wherein reflowing the die assembly comprises:
2 increasing the reflow temperature to react the monomer to form solid polymer
3 and to form solder joints from the solder bumps; the solid polymer being melted into
4 polymer liquid, and
5 decreasing the reflow temperature to solidify the solder joints and the polymer
6 liquid.

1 18. The method of claim 11 further comprising:
2 de-fluxing the die assembly to remove polymer residue.

1 19. The method of claim 18 wherein de-fluxing comprises:
2 dissolving the polymer residue by hot water.

1 20. The method of claim 18 further comprising:
2 dispensing an underfill material into a gap between the die and the substrate.

1 21. A system comprising:
2 a flux dispenser to apply a flux on a substrate having solder bumps, the flux
3 including at least a solvent and a water soluble monomer or a water soluble polymer;
4 a die placement assembly to place a die on the substrate ; and
5 a reflow oven to reflow the die at a reflow temperature to redistribute stress
6 caused by coefficient thermal expansion (CTE) mismatch between the substrate and the
7 die, the reflow temperature being higher than a melting point of the polymer.

1 22. The system of claim 21 wherein the water soluble polymer is one of a
2 polyacrylic acid, a polyacrylamide, a polyvinyl alcohol, a starch, and a cellulose.

1 23. The system of claim 21 wherein the flux includes at least an organic
2 solvent and the water soluble monomer.

1 24. The system of claim 21 wherein the flux includes at least an organic
2 solvent and the water soluble monomer.

1 25. The system of claim 21 wherein the reflow oven vaporizes the solvent at
2 an increasing reflow temperature, melts the polymer into polymer liquid, and removes
3 metal oxide from the solder bumps.

1 26. The system of claim 25 wherein the reflow oven further melts the solder
2 bumps, forms solder joints from the melted solder bumps, solidifies the solder joints at
3 a decreasing reflow temperature, and solidifies the polymer liquid to redistribute the
4 stress.

1 27. The system of claim 21 wherein the reflow oven vaporizes the solvent at
2 an increasing reflow temperature, reacts the monomer to form solid polymer, melts the
3 solid polymer into polymer liquid, and removes metal oxide from the solder bumps.

1 28. The system of claim 27 wherein the reflow oven further melts the solder
2 bumps, forms solder joints from the melted solder bumps, solidifies the solder joints at
3 a decreasing reflow temperature, and solidifies the polymer liquid to redistribute the
4 stress.

1 29. The system of claim 21 further comprising:
2 a de-fluxing dispenser to de-flux the die to remove polymer residue; and
3 an underfill dispenser to dispense an underfill material into a gap between the
4 die and the substrate.

1 30. The system of claim 21 wherein the de-flux dispenser dissolves the
2 polymer residue by hot water.